

Some Like it Hot!

Advanced Level



Purpose

To introduce students to the concepts of remote sensing and false colored images. Students will produce false color images of an area of their choice. By creating two images with different grid size, they will understand differences in image resolution.

Overview

The advanced level of *Some Like It Hot!* is designed to demonstrate how a satellite sensor reads information. The students will make a grid and use it to measure the thermal reflectance of the land cover visible within the squares of the grid. The end product will be a thermal map created in pixel form.

Time

Three to five class periods

Level

Advanced

Key Concepts

Orbiting satellites take photographs with cameras that are sensitive to a variety of different wavelengths.

One of the main wavelengths sensed is thermal radiation or heat reflectance. The sensor reads the amount of heat being radiated and makes a picture out of the different values.

When students observe something without touching it they are actually using their eyes, ears, nose, and skin surface to remotely sense that object.

Skills

Observing a given area

Measuring different land types with a thermometer

Comparing different areas for thermal radiance

Mapping a thermal image

Materials and Tools

Meter sticks

String

Tape

Paper cup thermometer apparatus from intermediate activity

Preparation

A premade grid as a demo would be useful. See *Some Like It Hot Thermal Sensing Grid Sheet* for example.

Prerequisites

A prerequisite for this activity is the intermediate activity.



What To Do and How To Do It

1. Students work in groups of three or four to construct a large grid. They use four meter sticks taped together for the outer frame. They create the grid by taping string across the width at the 20 cm intervals and then taping string across the length at 20 cm intervals. See the diagram below.
2. The student groups go outside and find an area that contains a variety of land cover types within a square meter. An example might be the edge of the blacktop where grass and sand are showing, or rocks or ice etc. The students draw and label the area.
3. The students place the grid over the area they sketched. In each square of the grid, they measure the temperature with the paper cup thermometer apparatus as in the Intermediate activity. They record their findings on the Some like It Hot! Thermal Sensing Grid Sheet found at the end of this activity.
4. In the classroom, they color in the grid using the color key developed in the intermediate activity. They have developed a thermal sensing map like the satellite images they use.

Part 2

1. Repeat the experiment with a finer grid, every 10 cm.
2. How does the change in grid size affect the map? Scientists refer to this change in grid size as change in resolution. As the resolution becomes finer, more and more specific information is displayed. Different resolutions are needed for different types of inquiry.
- 2a. Students compare both images within the group (20 cm and 10 cm)
 - Which image has the most identifiable picture?
 - Which image would be most useful for land cover assessment over a large area?
 - Which image would be most useful for a land cover assessment over a small area?

- 2b. Students trade images with another group.
 - Can they tell where that area is outside?
 - What kinds of land cover items might be there?
 - Which image gives them the best clues?
- 2c. Students compare images with the whole class. They discuss the value of thermal sensing to the world. As a possible extension, they can research some of the ways that thermal sensing is used.

What To Do Next

Predicting Snow Melt Patterns

Students use their temperature sensor map to predict a pattern of snow melt at the end of winter.

1. Explain to the students that the information they generated about the relative temperatures of land covers may help them predict the pattern of snow melt in their area. Review the data they collected during the temperature sensor map activity. Have them predict where the snow will melt the fastest in the spring and record those ideas and their reasons for later discussion.
2. Divide the teams into groups. Each team is assigned to a particular land cover within the site studied for the temperature sensor map activity. As spring nears, the students make daily trips to their location and record their observations.
3. As the snow melts to ground level, the students report land cover sightings. The sequence of land covers which become visible are recorded.
4. After all the data are recorded, the information is compared with the ice cube activity information gathered during the Beginning activity and any anomalies are explained by the students. Comparisons can be simplified by plotting observations onto wax paper or acetate and overlaying this plot on the original thermal map.

Some Like It Hot!

Name:

Date:

Temperature Sheet

Chart 1

| | Range | Color | | Range | Color |
|-----|-------|-------|-----|-------|-------|
| 1. | | | 11. | | |
| 2. | | | 12. | | |
| 3. | | | 13. | | |
| 4. | | | 14. | | |
| 5. | | | 15. | | |
| 6. | | | 16. | | |
| 7. | | | 17. | | |
| 8. | | | 18. | | |
| 9. | | | 19. | | |
| 10. | | | 20. | | |

Chart 2

| | Object | Temperature | Color |
|----|--------|-------------|-------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |

Chart 3

| | Land Cover | Temperature | Color |
|----|------------|-------------|-------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |

Table LAND-L-15: Thermal Sensing Grid - Some Like It Hot

Some Like It Hot

Name of Group:

Date:

Thermal Sensing Grid

| | | | | |
|--|--|--|--|--|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |



What To Do Next

Predicting Patterns of Seed Germination

Students use their temperature sensor map to predict a pattern of seed germination in the spring.

1. Explain to the students that the information they generated about the relative temperatures of land covers may help them predict where seed sprouts may first appear in the spring. Review the data they collected during the temperature sensor map activity. Have them predict where they think sprouts will first appear in the spring and record those ideas and their reasons for later discussion.
2. Divide the teams into groups. Each team is assigned to a particular land cover within the site studied for the temperature sensor map activity. As spring nears, the students make daily trips to their location and record their observations.
3. As the snow melts to ground level, the students report vegetation sightings. The location of the first sprouts are recorded. Students use field guides to assist in the identification of the types of vegetation reported.
4. After all the data are recorded, the information is compared with the ice cube activity information gathered during the Beginning activity and any anomalies are explained by the students. Comparisons can be simplified by plotting observations onto wax paper or acetate and overlaying this plot on the original thermal map.

